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AUTHOR Haaga, David A.
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ABSTRACT

State-dependent retention (SDR) refers to the tendency to recall something more easily when in the same state as when one first learned it. The most directly relevant evidence in favor of mood SDR has confounded matching of mood at learning and recall with matching of mood induction procedure. A study was conducted to test directly whether the use of identical mood induction procedures can account for prior evidence of mood SDR. College students (N=157) participated in a two (same versus different mood at learning and free recall of neutral words) by two (same versus different type of mood induction at learning and recall) experiment. The results revealed that recall did not significantly differ among the groups. Subjects did not recall more if in the same mood at learning and recall, and the extent to which mood ratings differed between learning and recall did not relate to recall. Subjects receiving the same type of mood induction procedure both times also failed to show superior recall. Use of neutral material might have precluded finding effects of mood on memory, but neutral material is optimal for separating mood SDR from mood-congruent retrieval. (Author/NB)

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Mood SDR

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Mood State-dependent Retention Using Identical or Non-
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David A. Haaga

University of Southern California

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Requests for reprints should be sent to David A. Haaga, Department of Psychology, Seeley G. Mudd Building. University of Southern California. Los Angeles, CA 90089-1061.

Mood State-dependent Retention Using Identical or Non-
identical Mood Inductions at Learning and Recall

Abstract

The most directly relevant evidence in favor of mood state-dependent retention (SDR) has confounded matching of mood at learning and recall with matching of mood induction procedure. This study had one hundred fifty-seven college students participate in a two (same versus different mood at learning and free recall of neutral words) by two (same versus different type of mood induction at learning and recall) experiment. Recall did not significantly differ among the groups. Use of neutral material might have precluded finding effects of mood on memory, but neutral material is optimal for separating mood SDR from mood-congruent retrieval.

Mood State-dependent Retention Using Identical or Non-identical Mood Inductions at Learning and Recall

State-dependent retention (SDR) refers to the tendency to recall something more easily when in the same state as when one first learned it. SDR has been documented for a variety of "states," including being under water versus on land (Godden & Baddeley, 1975) as well as drug states (e.g., Eich, Weingartner, Stillman, & Gillin, 1975). Recent theory and research have examined the possibility that mood could serve as a context inducing SDR.

The associative network theory of emotion (Bower, 1981) attempts to account for mood SDR. A given mood is represented by a node in a memory network, with connections to memories and concepts learned in that mood. Any means of induction of a mood, then, activates the node for that mood and causes activation to spread to associated nodes, including those for material encountered previously in the same mood, making recall more likely.

Mood SDR has important implications for theories of depression and its therapy, leading theorists to consider the role of current mood in cognition instead of viewing cognitive styles as essentially invariant. Extensive treatment of this and related issues can be

found elsewhere (Ingram, 1984; Riskind & Rholes, 1984; Teasdale, 1983). My concern is more with the status of the evidence for mood SDR. First, I shall try to show that correlational studies or experiments including only one mood induction do not provide solid evidence for or against mood SDR. Second, I shall argue that supportive evidence from experiments with two mood inductions is ambiguous because similarity of mood at learning and recall has usually been confounded with similarity of the exact procedure for inducing mood.

Mood Congruence

Correlational studies involving depressed people, as well as experiments using mood inductions to vary current mood among nonclinical subjects, have documented mood congruence in memory (for a review, see Blaney, 1986). That is, material whose emotional valence matches a person's current mood is more likely to be recalled. Several controversies remain. For example, effects of mood may be stronger on positive than on negative material (Isen, 1985; Williams & Broadbent, 1986) and may be more evident among female than male subjects (Clark & Teasdale, 1985). Also, results with depressed persons may represent response biases rather than genuinely selective negative recall (Martin & Clark, 1986ab; Zuroff, Colussy, & Wielgus,

1983, 1986). Nevertheless, mood congruence as an empirical phenomenon does seem to be reliable.¹

Some have interpreted mood congruence effects as support for mood SDR. For example, Teasdale and Russell (1983) found that subjects recalled more negative words when a negative mood was induced, more positive words when positive mood was induced, after they had learned the word list in neutral mood. Teasdale and Russell viewed their results as "consistent with an explanation broadly in terms of state-dependent learning." (p. 170) by appealing to the intuition that positive and negative material has been associated for most people with the corresponding mood nodes.

Although this assumption is plausible, several considerations preclude interpretation of mood congruence data as support for mood SDR. First, events of a given valence might sometimes be associated with opposite emotions. Some events that seem pleasant to observers, for instance, (and that we may describe as pleasant) are more likely tied in our own memories to feelings such as disappointment, envy, boredom, and depression (Percy, 1983). Studies by Teasdale and his colleagues suggest that correlations among ratings of the pleasantness of a past event and the happiness one

felt about it at the time are about .7 -- large but not perfect; 29% (Teasdale, Taylor, & Fogarty, 1980) and 12% (Teasdale & Taylor, 1981) of experiences rated as unpleasant were also rated happy.

Second, self-devaluative mood induction statements (taken from Velten's (1968) procedure) can directly prime mood-congruent cognitions, independent of their impact on mood, suggesting that not all mood congruence effects are mediated by mood SDR (Rholes, Riskind, & Lane, 1987).

In short, there seems to be sufficient reason to maintain a distinction between mood SDR and mood congruence. As Isen (1984) pointed out, mood SDR refers specifically "to the facilitation of recall by the matching of states at time of learning and recall, not more generally to the tendency of affective states...to facilitate or impair recall of a specific type of material" (p. 193).

Effects of Mood Similarity at Learning and Recall

The most crucial evidence bearing on mood SDR, then, derives from studies experimentally manipulating mood at both learning and recall. Data from such experiments are less consistent and clear than in the area of mood congruence.

Two studies failing to find mood SDR did not

measure mood, leaving open the possibility that it was not successfully manipulated (Isen, Shalcker, Clark, & Karp, 1978; Nasby & Yando, 1982). Another two studies showed asymmetric mood SDR: retention was superior only if learning and recall moods were both positive, not both negative (Bartlett, Burleson, & Santrock, 1982, Experiment 2; Bartlett & Santrock, 1979). However, negative moods were less strongly and consistently induced. In Bartlett et al. (1982, Experiment 2), for example, self-rating of mood on a scale from 1 (very happy) to 5 (very sad) showed that the average subject was quite happy after a positive mood induction ($M = 1.06$), but essentially neutral after a negative one ($M = 2.58$).

Some have suggested that conflicting results can be accounted for by postulating that mood SDR is a genuine but weak effect, with matching of mood states facilitating recall only if other recall cues are weak. Null results have been obtained with integrated story material rather than a list of unrelated words (Bower, Gilligan, & Monteiro, 1981; Experiment 3), and when target words are presented alone (Bower, Monteiro, & Gilligan, 1978, Experiments 1 and 2; Schare, Lisman, & Spear, 1984, Experiments 1 and 2) rather than with an additional distractor list (Bower et al., 1978,

Experiment 3; Schare et al., 1984, Experiment 3).

However, evidence on this point is mixed (Blaney, 1986). Mood SDR findings with interference designs have been difficult to replicate (Bower & Mayer, 1985; Wetzler, 1985). Also, Leight and Ellis (1981) found mood SDR in only one of eight possible comparisons. Their significant result was a recognition rather than free recall test, which seems inconsistent with the 'weak cue' explanation. Finally, mood SDR has been reported in at least one study using integrated story material and no interference material (Mecklenbrauker & Hager, 1984).

The main motivation for the present study stemmed from a different view of the mood SDR data base. Those who have manipulated mood at learning and recall have typically used the same type of mood induction both times. Bartlett et al. (1982) had children remember a recent happy or sad event; Isen et al. (1978) had subjects win or lose a computer game; Macht, Spear, and Levis (1977), who found evidence of mood SDR in one study but also reported two replication failures, used threat of shock to induce anxiety; Leight and Ellis (1981) and Schare et al. (1984) used the Velten (1968) technique. Bartlett and Santrock's (1979) study is more difficult to classify in this fashion. Both mood

inductions featured interaction with a female experimenter (albeit different persons) acting either happy or sad, followed at learning by happy or sad stories and at recall by happy or sad drawings. Since mood ratings were taken only after the second set of stimuli, it is unclear to what degree the common element in both procedures (experimenter - child interaction) was effectively the mood induction procedure.

When the type of mood induction procedure used at learning and recall is the same, there is no way to separate the impact of mood similarity at learning and recall from that of induction procedure similarity. Reading a set of statements about moods, for instance, itself could serve as a cue that might facilitate recall if performed again just before testing. As Blaney (1986) put it, "because inductions during exposure and recall or recognition were identical, any support for state dependence that emerged is questionable, given that effects could be attributed to similarities in cognitive content as opposed to mood per se." (p. 230).

Suggestive support for this analysis of prior mood SDR evidence derives from data recently reported by Brown and Taylor (1986). Using different induction

procedures prior to encoding and retrieval (autobiographical recollections or the Velten technique), they found no evidence of mood SDR among undergraduate women regardless of whether trait adjectives were encoded via self-referencing or phonemic quality. They had predicted mood SDR only under phonemic encoding instructions, which do not promote as effective learning as self-schematic encoding instructions and thus could benefit from mood matching as an additional recall cue.

Bower et al. (1978; Experiment 3) used different hypnotic scenes at learning and recall in finding mood SDR. However, only about one-fourth of all potential subjects are sufficiently hypnotizable to qualify for hypnotic mood induction studies (Bower, 1981), limiting generalizability. Also, as noted earlier, replication failures have been reported.

Hypotheses

The present experiment was conducted in order to test directly whether the use of identical mood induction procedures can account for prior evidence of mood SDR. The first hypothesis, consistent with mood SDR, is that subjects in the same mood at learning and recall will remember more words than subjects in opposite moods at learning and recall.

A second hypothesis is that subjects receiving the same type of mood induction at learning and recall will remember more words than will subjects getting a different type of induction.

Finally, the autobiographical recollections mood induction procedure is expected to exceed a Velten-like method in inducing increased happiness and decreased sadness (positive induction) and the opposite (negative induction) (Brewer, Doughtie, & Lubin, 1980). Self-rated anxiety will also be measured to test the specificity of the two inductions. It has been claimed as a weakness (Polivy, 1981) or a strength (Brewer et al., 1980) that inductions aimed at increasing sadness appear to increase anxiety as well.

Method

Subjects

Subjects were 157 undergraduates from introductory psychology classes at the University of Southern California. They received partial course credit in exchange for participation. A slight majority (52%) were women, and the average age was 19.0 years (range = 17 to 29). All subjects were fluent in English. Data from seven other subjects were discarded for incidental reasons (e.g., failure to follow instructions).

Apparatus

The subject sat in a comfortable chair at a desk containing mood rating forms. The experimenter operated from the next room a Nakamichi cassette deck, which played the general introduction to the experiment, instructions for mood ratings and mood inductions, the word list to be recalled, and recall instructions.

Procedure

The subject heard an introduction to the study, which explained that he or she would hear a list of words and would be asked later to recall as many of the words as possible. Then the subject signed an informed consent form, and learned how to use the mood rating scales. The experimenter left the room and rolled a die to determine group assignment.

Mood ratings and mood criteria.

Subjects rated mood by putting marks through 100 mm lines anchored at each end by I do not feel at all X (0) and I feel extremely X (100), X being anxious, happy or sad. The phrase "at this moment" was printed at the top of each mood rating form to reinforce the instruction to rate current mood. This procedure follows Teasdale and Russell (1983).

Subjects rated mood before and after the first mood induction, which preceded the word list, and

before and after the second mood induction, which preceded recall. To be included in recall data analysis, a subject had to rate after each induction the induced mood at 50 or higher on the 0-100 scale and the opposite mood below 50.

Mood inductions.

Subjects were randomly assigned to one of four groups, crossing same versus different mood (positive, negative) with same versus different type of induction (Velten, autobiographical recollections) at learning and recall. After random assignment, the subject received the first mood induction. If the Velten-like induction was indicated, the subject got a set of 12 cards each containing one mood-relevant sentence. This shortened version of Velten's (1968) procedure was introduced by Teasdale and Taylor (1981). It omits references to personal experiences (e.g., "I regret some of the things I have done in the past"), retaining only statements pertaining to feelings (e.g., "I feel pretty good right now"). As the second induction procedure (see below) involves recall of personal experiences, Teasdale and Taylor's version of the Velten procedure seemed to be ideal for this study, to maximize the distinction between the two types of induction.

The subject was instructed to read the cards, trying hard to get into the described mood. Instructions emphasized the importance of full involvement in this aspect of the experiment. The subject was directed to proceed at his or her own rate, spending roughly equal amounts of time on each card (about 30 seconds) but with the option to spend more time on any cards that seemed especially effective. The subject then had seven minutes to read the cards.

Autobiographical recollections inductions consisted of asking subjects to recall and think for two minutes each about three increasingly happy (unhappy) events or specific situations from their lives.

Word list.

After the first mood induction and subsequent mood rating, the subject heard an audiotaped reading of 36 neutral nouns, the whole list being read twice at the rate of one minute per reading. The words are the neutral non-trait words from the lists developed by Teasdale and Russell (1983) and were originally selected from among neutral words of moderate frequency of usage compiled by Battig and Montague (1969). The list is as follows: novel, bear, television, apricot, sword, trailer, chisel, vanilla, rock, jacket, brick,

carbon, eagle, game, petunia, zinc, grasshopper, engineer, screwdriver, garlic, lake, kilometer, linen, sulphur, cathedral, care, electricity, trombone, brass, dentist, golf, bomb, pineapple, hand, pig, desk.

After hearing the word list, the subject took a five minute break outside the laboratory. Following the break was a second mood induction, with mood ratings before and after the induction. Then the subject heard an audiotaped instruction to write down in any order in the next two minutes as many of the words as he or she could recall from the list. Two minutes later the experimenter informed the subject that the session was over, explained more fully the purpose of the study, and asked the subject not to discuss the experiment with other students. The experimenter conversed with and reassured subjects who had received a negative induction until confident that they would be leaving in a satisfactory mood.

Results

The major hypotheses of the study were not supported. Subjects did not recall more if in the same mood at learning and recall, and the extent to which mood ratings differed between learning and recall did not relate to recall. Subjects receiving the same type of mood induction procedure both times also failed to

show superior recall.

Ninety-three subjects (59% of sample) met the mood criteria for inclusion in the main analysis. For these subjects, a 2 (same versus different mood at learning and recall)² X 2 (same versus different type of mood induction at learning and recall) analysis of variance was conducted with number of words recalled as the dependent variable. Main effects for mood similarity ($F(1, 89) = .40, p > .5, MSe = 16.99$) and induction similarity ($F(1, 89) = .00, p > .9, MSe = 16.99$) were nonsignificant, as was their interaction ($F(1, 89) = .17, p > .6, MSe = 16.99$). Tukey-Kramer multiple comparisons showed no significant differences in recall between those in the same mood condition ($n = 54, M = 12.32, SD = 3.69$) and those in the different mood condition ($n = 39, M = 11.77, SD = 4.57$), nor between those getting the same type of induction ($n = 47, M = 12.06, SD = 3.61$) or different induction ($n = 46, M = 12.11, SD = 4.52$). The cell means are shown in Table 1.

Insert Table 1 about here

To test the possibility that these results were determined by the particular mood criteria selected,

the 2 X 2 analysis of variance on recall scores was also conducted using several other criteria: (a) the induced mood should be rated at least 60 and its opposite no more than 40 ($\underline{n} = 67$); (b) the induced mood should be rated at least 70 and its opposite no more than 30 ($\underline{n} = 37$); and (c) the induced mood should be rated at least 20 points higher than its opposite ($\underline{n} = 93$). In no case did the results differ from the pattern described above, that is, nonsignificant main effects and interactions and nonsignificant multiple comparisons of means. These results also held for male and female subjects separately.

The absence of a linear association between recall and either mood or induction similarity is further illustrated by low, nonsignificant correlations among all subjects of recall with difference in sadness ($\underline{r} = .00$, $\underline{p} > .9$, $\underline{N} = 157$), happiness ($\underline{r} = -.02$, $\underline{p} > .7$, $\underline{N} = 157$), or induction type ($\underline{r} = .05$, $\underline{p} > .4$, $\underline{N} = 157$) between learning and recall.

A secondary set of analyses concerned the relative success of the two types of mood induction, printed self-referent statements and autobiographical recollections. Initial anxiety, happiness, and sadness ratings did not differ significantly across conditions, attesting to the success of random assignment. Pre-

post change scores on anxiety, sadness, and happiness did not differ significantly across induction type at the second induction (pre-recall). The first induction (pre-learning), however, showed that positive mood statements and autobiographical inductions were about equally effective but that the negative autobiographical induction was more effective than the negative mood statements induction. The autobiographical induction increased sadness ratings more ($M = 46.4$ vs. 25.1 ; $t(78) = 4.36$, $p < .001$) and decreased happiness ratings more ($M = -34.5$ vs. -17.6 , $t(78) = 3.84$, $p < .001$), while neither changed anxiety much ($M = -1.0$ vs. $.4$)³. Thus, some support was found for the superiority of negative inductions delivered by having subjects recall personal experiences rather than rehearsing negative self-referent statements (Brewer et al., 1980).

Discussion

The negative result obtained here adds further doubt regarding mood SDR. Although mood-congruent retrieval appears to be reliable, a recall advantage based on matching of mood states between learning and recall is difficult to demonstrate.

The use of neutral material facilitated the testing of SDR separately from mood-congruent

retrieval. However, Bower (1986) recently suggested that mood SDR is more likely to be detected when the material to be learned is seen as causing one's emotional reactions, thereby forming a stronger association between mood and the material. This qualification of the mood SDR prediction, which originally was thought to pertain to any sort of material conceptually or temporally linked to mood states, would account for the present results. It should be recognized, however, that this qualification would make it extremely difficult to detect mood SDR effects that could not also be attributed to mood congruence (Leventhal & Tomarken, 1986), given that any learning material subjects could see as causing their emotional reactions would very likely be mood-congruent in valence. Mecklenbrauker and Hager (1984) were able to find mood SDR for mixed story material but did not analyze the neutral material data separately. Until the boundary conditions of the phenomenon are more definitively established, it is difficult to place much confidence in mood SDR in itself or as an explanation for such phenomena as the impact of moods on self-efficacy expectations (Kavanagh & Bower, 1985) and endorsement of irrational beliefs (Madigan & Bollenbach, 1986).

Mood Induction Procedures

Similarity of mood induction type did not affect recall, failing to support the idea that confounding of mood similarity with similarity of induction type could account for prior mood SDR findings (Bartlett et al., 1982; Bartlett & Santrock, 1979; Leight & Ellis, 1981; Schare et al., 1984). The failure to find SDR based on induction type might result from only slight differences between the inductions for some subjects. Little is known about how people try to achieve the moods prescribed for them by mood induction procedures (Clark, 1983). It is typically assumed they do so in the manner called for in the protocol (e.g., reading mood-related statements and thinking about them), but perhaps subjects use similar tactics regardless of the induction. If so, the "different induction type" condition would not have been adequately realized and would not differ from the "same induction" condition. Further research could fruitfully examine the process of mood induction from the subject's point of view, rather than looking only at the outcome as reflected in mood ratings and their correlates.

Some support was found for the superiority of negative mood induction by way of autobiographical recollections, as well as for its specificity to

sadness and not anxiety. This appears to be a relatively powerful technique that could be used in diverse mood induction studies. To be sure, the Velten technique may have been equally successful if a longer version of it had been used, as in Brown and Taylor (1986).

The Velten-like technique also appeared to be specific in the sense of affecting sadness but not anxiety, consistent with the report by Isen and Gorgoglione (1983) but not that of Polivy (1981). It may be that the latter study found a more diffuse effect on multiple negative emotions because the dependent measure, the Multiple Affect Adjective Check List (MAACL; Zuckerman, Lubin, & Robins, 1965), shows high intercorrelation of subscales (Kelly, 1972).

In sum, this experiment supports the growing doubt about mood SDR (e.g., Leventhal & Tomarken, 1986). It failed to emerge under conditions designed to separate it from recall advantages based on congruity of current mood with the valence of learning materials or on matching of induction procedures.

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Footnotes

¹Hasher, Rose, Zacks, Sanft, and Doren (1985) did not obtain evidence of selective negative recall among college students showing mild levels of depressive symptoms on the Beck Depression Inventory. This discrepancy highlights the need for caution in interpreting studies, such as that of Zuroff et al. (1983), that use BDI-screened students as an analogue "depressed" group (Deardorff & Funabiki, 1985).

²Same-mood positive subjects did not significantly differ in recall from same-mood negative subjects.

³Twelve comparisons were made -- effects on anxiety, happiness, and sadness at first or second induction of positive or negative type -- between the Velten-like induction and the autobiographical induction. The Type I error rate can be held at .05 by considering significant only those comparisons significant at the .05/12 or .004 level, as are the two cited in the text.

Table 1

Mean Words Recalled

Induction type	Mood at learning and recall	
	Same	Different
Same	12.44 (<u>SD</u> = 3.65)	11.55 (<u>SD</u> = 3.59)
Different	12.19 (<u>SD</u> = 3.79)	12.00 (<u>SD</u> = 5.51)